Appendix D
STANDARD OBSTACLES

This appendix provides time, personnel equipment, and material estimating factors for obstacle planning. Reconnaissance or experience in a particular area may require that the planning factors be modified. The estimates given in this appendix are generally based upon "standard" sizes and types of obstacles. The basic purpose of the "standard" obstacle concept is to permit rapid estimating for resource requirements. Early estimation of resource requirements assists in personnel allocation and early requisition of material to accomplish the mission. For instance, if 40 hasty road craters are required in a particular obstacle plan, multiply the resources required for the hasty crater to get a reasonable estimate of the resources required. The estimates will not always be as accurate as an on-site reconnaissance; detailed obstacle planning is the most accurate method of determing resource requirements.

ARTILLERY DELIVERED SCATTERABLE MINES (ADAM/RAAMS)
(designator MFA)

ANTITANK MINES
(designator MFAT)
HIGH ANGLE FIRE
Area covered 400M x 400M

RAAMS

Purpose	Density	Rounds Per Aimpoint
Harass enemy	.001	24
Covered by heavy, direct fire	.002	48
Covered by light, direct fire	.004	96

ANTIPERSONNEL MINES
(designator MFAP)
HIGH OR LOW ANGLE OF FIRE
Area covered 400M x 400M

ADAM

Density	Rounds Per Aimpoint
.0005	3
.001	6
.002	12

RAAMS
LOW ANGLE FIRE
Area covered 200M x 200M

Purpose	Density	Rounds Required
Harass enemy	.001	6
Covered by heavy, direct fire	.002	12
Covered by light, direct fire	.004	24

GROUND EMPLACED MINE SCATTERING SYSTEM (GEMSS) (M128)
(designator MFG)
Antitank (designator MFGT)
Antipersonnel (designator MFGP)
Mixed (designator MFGM)

Width: 60M*

Length (M)**	13,333	2,666	1,904	1,333	533
Density (mines/M²)	.001	.005	.007	.01	.025
Effort (squad hours)	2.24	.45	.32	.22	.09

NOTES:

It is recommended mines be placed at 5AT to 1AP for 800 mines. This would equate to 666AT and 134 AO mines. Transport vehicles should be loaded in a 5 to 1 ratio also. The mines in a GEMSS dispenser loaded in this manner would weigh approximately 3,500 pounds.

Effort is based on laying time only. It takes the squad 24 minutes to load 800 mines. Additional time should be planned for hookup, pre-op checks, marking, and reloading (if needed).

GEMSS dispensers can lay either 30M- or 60M-wide belts. It is recommeded that at least two 60M belts be used. Three 60M belts are optimum.

A density of .005 per square meter (M²) is recommended for most minefields, but depending on the tactical situation, other densities may be more desirable.

*If every mine of a maximum 800-mine load is dispensed.

**Length of minefield may be doubled when a width of 30M is used.
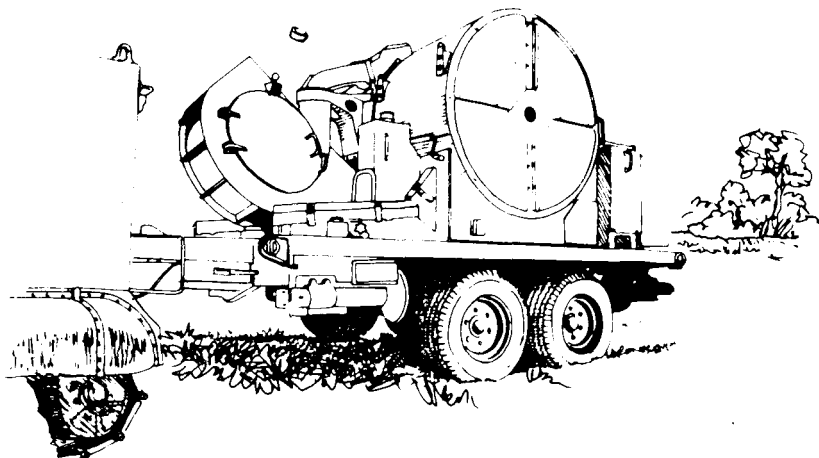
MODULAR PACK MINE SYSTEM (MOPMS)
(designator MFM)
ANTITANK (designator MFMT)
ANTIPERSONNEL (designator MFMP)

| Area	Number of Mines	Density	Weight
Semicircle-35M radius	21	.01	150 LB

NOTES:
Greater densities can be obtained by overlapping the dispensing pattern.

MOPMS contain only antitank or antipersonnel mines. A mixed minefield is obtained by overlapping patterns of each type.

If employing a mixed minefield, fire the AP last. This will prevent AT mines landing on the tripwires of the AP mines and detonating them prematurely.

NOTE: Future versions of MOPMS are planned to contain 17 AT and 4 AP mines in each container.
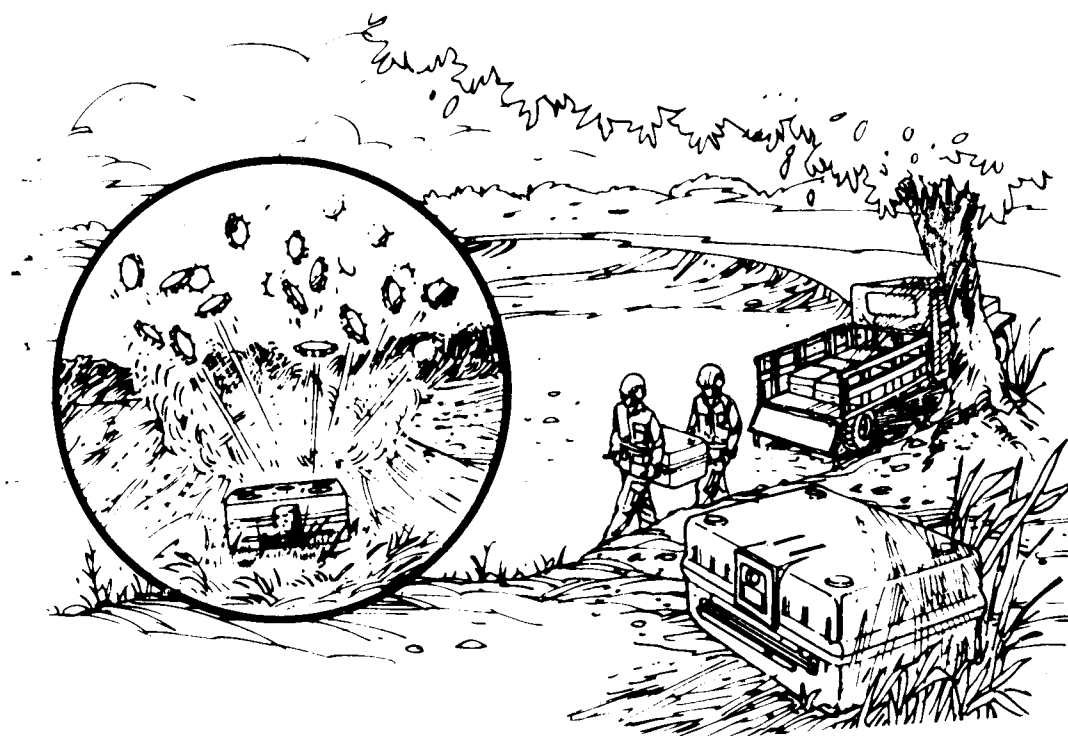
## HELICOPTER DELIVERED AT MINE DISPENSING SYSTEM (M56)
(designator MFH)

Width: 20M

Length (M)	1,600	800
Density (mines/M^2)	.005	.01
(mines/meter of front)	.1	.2
Time (minutes)	1 to 3	1 to 3

NOTES:

Data is based on one UH-1 sortie with the maximum load of mines (two 80-mine pods).

For a .005 minefield, the mines are released from one pod. For .01 density, they are released from two pods at the same time.

Times are for on-site recon and delivery. Delivery speeds are 70 to 100 knots, and the altitude is a minimum of 100 FT to a maximum of 200 FT.
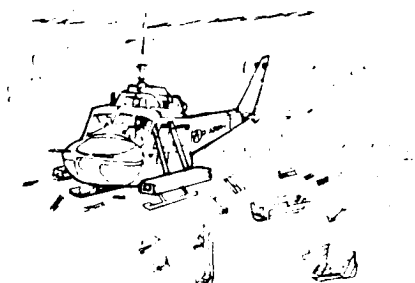
USAF DELIVERED SCATTERABLE MINES (GATOR)
(designator MFAF)

NOTES:

Area of minefield is dependent upon the speed and altitude of the aircraft.

Density is dependent upon the number of canisters that are dropped.

Each canister contains 72 AT and 22 AP mines.

AT MINE DISPENSING SYSTEM (M57)
(designator MFD)
Depth of minefield: 50 meters

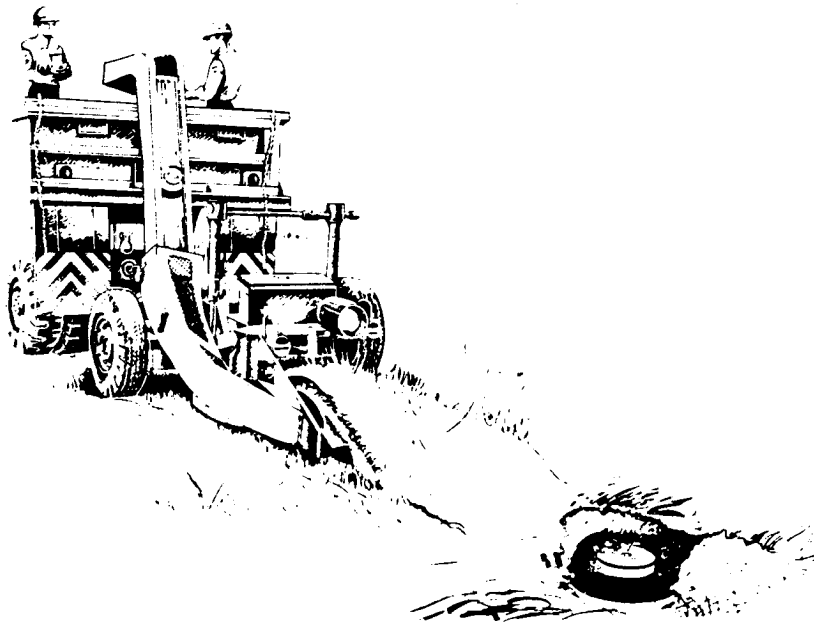| Length (M)	100	200	300	400	500	600
Type	H1	H2	H3	H4	H5	H6
Density	(0.5 — 0.5 - 0 mines/meter of front)					
Number of Mines M15 AT	55	110	165	220	275	330
Effort (platoon hours)	0.4	0.8	1.3	1.7	2.1	2.5

NOTES:
Laying speed is 1 to 3 mph depending on terrain. Limitation is the speed of two personnel standing in the truck loading mines. Surface laying does not reduce time.
Maximum Speed: Highway 35 mph
Cross country 5 mph

A 5-ton dump truck will hold 288 racked mines.

CONVENTIONAL MINEFIELDS
(Hand Laid)

3-Strip Standard Pattern with IOE
(designator MFJ)
Depth of minefield: 100 meters

Length (M)	100	200	300	400	500	600
Type	J1	J2	J3	J4	J5	J6
Density	(0.5 — 0.5 - 0 mines per meter of front)					
Number of Mines						
M21 AT	69	136	203	270	337	404
M16 AP	69	136	203	270	337	404
Weight (tons)*	1.7	3.0	4.3	5.6	6.9	8.1
Effort (manhours)						
Experienced	32	62	92	122	152	182
Inexperienced	48	93	138	183	228	273

*Weight includes mines, wire, and pickets.

3-Strip Standard Pattern with IOE
(designator MFK)
Depth of minefield: 100 meters

Length (M)	100	200	300	400	500	600
Type	K1	K2	K3	K4	K5	K6
Density	(1 — 1 — 1 mines per meter of front)					
Number of Mines						
M21 AT	124	246	368	490	612	734
M16 APF	124	246	368	490	612	734
M14 APB	124	246	368	490	612	734
Weight (tons)*	2.6	4.9	7.1	9.4	11.6	13.9
Effort (manhours)						
Experienced	66	130	194	258	322	386
Inexperienced	99	195	291	387	483	579

*Weight includes mines, wire, and pickets.

DELIBERATE ROAD CRATER
(designator RCD)

Approximately 40 feet end to end, 25 feet wide, 8 feet deep, "V" shaped

Formula for number of holes: $\dfrac{L - 16}{5} + 1$

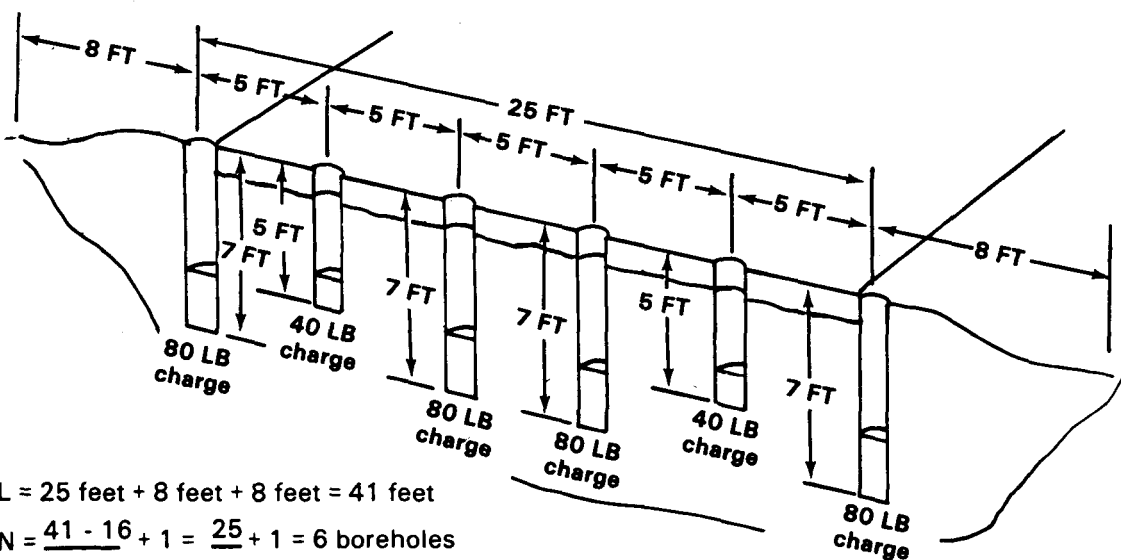To find "L," measure the roadway, then add 8 feet on each side

Example: Roadway width = 25 feet

To find number of holes: $\dfrac{41 - 16}{5} + 1 = \dfrac{25}{5} + 1 = 5 + 1 = 6$ holes

Dig alternating holes 5 and 7 feet deep. No 5 feet holes side by side.
Prime 7 feet holes with 80 LB explosive.
Prime 5 feet holes with 40 LB explosive.

MATERIAL REQUIREMENTS (Non-Electric):
10 ea 40 LB cratering charges
12 ea 1 LB blocks of TNT
300 FT detonating cord
10 non-electric blasting caps
20 FT time fuse
4 ea fuse lighters
Mines - if you intend to mine the crater
7 ea 40 LB shaped charges to blow the boreholes
Auger to clean the holes or post hole digger
Approximate effort depending on road surface = 2 squad hours

L = 25 feet + 8 feet + 8 feet = 41 feet

$N = \dfrac{41 - 16}{5} + 1 = \dfrac{25}{5} + 1 = 6$ boreholes

Explosives needed = 4 x 80 pounds =
320 + 80 = 400 pounds

HASTY ROAD CRATER
(designator RCH)

Approximately 40 feet end to end, 20-25 feet wide, 6-7 feet deep, "V" shaped

Formula for number of holes: $\dfrac{L - 16}{5} + 1$

To find "L," measure roadway, then add 8 feet on each side

Example: Roadway width = 20 feet

To find number of holes: $\dfrac{36 - 16}{5} + 1 = \dfrac{20}{5} + 1 = 5$ holes

Dig all holes 5 feet deep. Prime each hole with 50 LB of explosive.

MATERIAL REQUIREMENTS:
5 ea 40 LB cratering charges
50 LB of TNT
200 FT of detonating cord
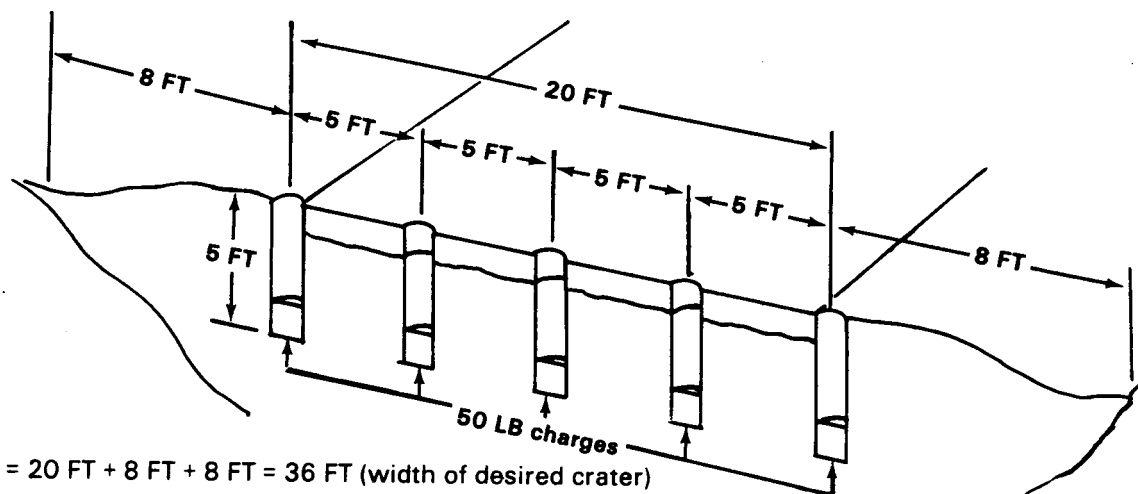20 FT of time fuse
4 ea fuse lighters
8 ea non-electric blasing caps
Mines - if you intend to mine the craters
5 ea 40 LB shaped charges
Auger or post hole digger
Approximate effort = 1½ squad hours

L = 20 FT + 8 FT + 8 FT = 36 FT (width of desired crater)

$N = \dfrac{36-16}{5} + 1 = \dfrac{20}{5} + 1 = 5$ (boreholes needed)

Explosive needed = 5 boreholes x 50 LB = 250 LB

CRATERING DEVICE (M180) WITH MINES
(designator RCM)
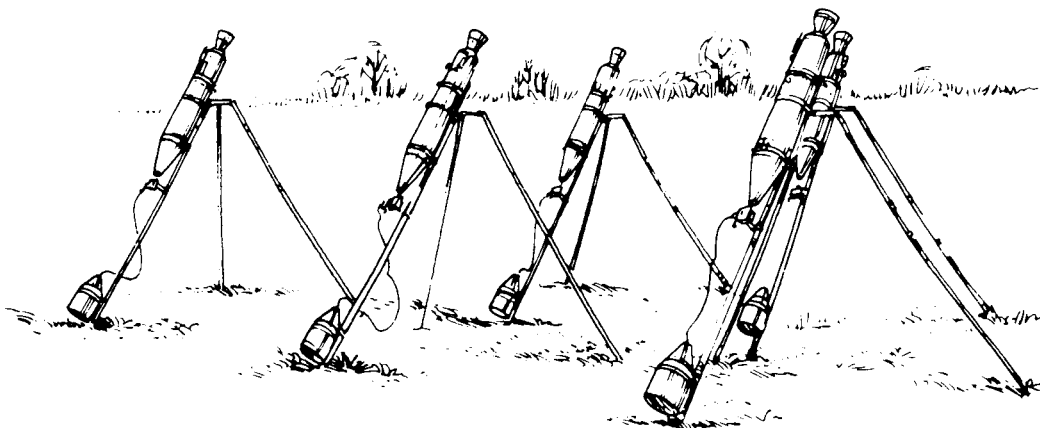
Relieved face 30 feet long x 18 feet wide x 8 feet deep
5 ea M180 kits = 730 LB
TOTAL WEIGHT = 751 LB
Mines as required
Effort = 1 squad hour

NOTE: A 50-cap blasting machine is required.

WIRE OBSTACLES

Triple Standard Concertina (designator WTC)

DESCRIPTION of a 300M section

Picket spacing:

Long pickets are 5 paces apart.
Short pickets are 2 paces from end of long pickets and used to anchor horizontal wire.
There are 2 rows of long pickets 3 feet apart.

Wire:

Two coils of concertina are placed side-by-side with a third coil placed on top.

EQUIPMENT/BILL OF MATERIALS

160 ea long pickets
4 ea short pickets
4 ea reels of barbed tape
56 ea coils of barbed tape concertina
Total weight = 2,190 KG (4,820 LB) or one 2 ½-ton truckload
Effort = One platoon hour per 300 meters

WIRE OBSTACLES (CONTINUED)

Nonstandard Concertina Roadblock (designator WRC)

As roadblocks, a series of barbed tape concertinas will impede the movement of vehicles. A series of these blocks placed about 10M apart should be used.

DESCRIPTION
(One roadblock) 11 coils placed side-by-side
3 long pickets per coil, 5 paces apart
Horizontal wire placed on top of each coil
Short pickets used to anchor horizontal wire

EQUIPMENT/BILL OF MATERIALS
30 ea long pickets
22 ea short pickets
11 coils barbed tape concertina
275 meters barbed wire
Total weight = 430.9 KG (950 LB)
Effort = One squad hour per obstacle

ABATIS
(designator ABT)

Situation: 100 meters of abatis required. Trees, 16 inches in diameter are spaced
approximately 10 meters apart on each side of the roadway. Firing non-electrically.

Formula for tree cutting: $P = \dfrac{D^2}{50}$

Number of trees = 20

TNT required per tree $\dfrac{16^2}{50} = \dfrac{256}{50} + 5.12$ LB, use 5 LB

Total TNT Required = 20 x 5 LB = 100 LB

OTHER MATERIALS REQUIRED
1,000 feet detonating cord
44 non-electric blasting caps
30 feet time fuse
4 fuse lighters
Tape or wire will be needed to secure TNT to the trees
Estimated effort = 2 squad hours

NOTE:
Blow one side at a time so that trees do not fall into each other.